

# IMPROVED CLAMSHELL APPARATUS WITH DYNAMIC UNIFORMITY CONTROL

## ABSTRACT OF THE DISCLOSURE

5           The present invention includes apparatus and methods for measuring impedance  
of a layer of deposited metal on a substrate and controlling deposition uniformity during  
electroplating. A first circuit delivers plating current to a metal layer on the substrate,  
and a second circuit, electrically isolated from the first, measures the impedance.  
Methods of the invention provide multi-point sheet resistance measurements before and  
10 during an electroplating process on a substrate. In a specific example, resistance is  
measured via a copper seed layer during electroplating.